

Application Serial No.: 10/623,243
Attorney Docket No.: 0140111

REMARKS

This is in response to the Final Office Action of November 22, 2004, where the Examiner has rejected claims 1-20. Reconsideration and allowance of outstanding claims 1-20 in view of the following remarks are requested.

A. Rejections of Claims 1-4, 6-13, 15-17, and 19-20 under 35 USC §103(a)

The Examiner has rejected claims 1-4, 6-13, 15-17, and 19-20 under 35 USC §103(a) as being obvious over U.S. Patent Number 5,399,903 to Rostoker, et al. ("Rostoker") in view of U.S. Patent Number 6,614,122 to Dory, et al. ("Dory"). For the reasons discussed below, Applicants respectfully submit that the present invention, as defined by independent claims 1, 9, and 16, is patentably distinguishable over the cited references.

As disclosed in the present application, a surface mount component is situated over a substrate. The surface mount component has first and second terminals. First and second pads are situated on the substrate and are coupled to the first and second terminals, respectively. Solder mask trench 124 is situated underneath the surface mount component and is filled with a molding compound.

As shown in, for example, Figure 1 of the present application, solder mask trench 124 is formed within, i.e. between portions of, solder mask 112. By forming solder mask trench 124 underneath the surface mount component and within solder mask 112,

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moldable gap 125 is advantageously formed to be substantially larger than a conventional moldable gap.

For example, in a conventional structure, solder mask 112 would extend between pads 106 and 108 underneath the surface mount component. As a result, a conventional moldable gap that would be formed between solder mask 112 and the bottom surface of the surface mount component would have height 130, shown in Figure 1. However, by forming solder mask 124 within, i.e. between portions of, solder mask 112, embodiments according to the present invention advantageously achieve a significantly larger moldable gap, having height 128, that improves molding compound flow underneath the surface mount component and, consequently, minimizes void formation underneath the surface mount component. As a result, embodiments according to the present invention advantageously minimize the risk of shorting between the terminals of the surface mount component during, for example, reflow assembly. Thus, the reliability of the surface mount component is advantageously increased.

In response to the previous Office Action, applicants amended independent claims 1, 9, and 16 to further illustrate aspects of the present invention by reciting "a solder mask trench situated underneath said surface mount component, said solder mask trench being filled with molding compound, said solder mask trench formed within a solder mask."

The Examiner acknowledges that Rostoker does not disclose a "solder mask trench formed within a solder mask", as recited in claims 1, 9 and 16. However, the Examiner states that Dory discloses a "solder mask trench formed within a solder mask", and leaps

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to a conclusion that it would have been obvious to one of ordinary skill in the art to modify Rostoker "to have formed the trench within the solder mask as taught by Dory et al ... for the purpose of controlling the flow of the underfill or molding compound." (Office Action, Page 3.) Applicants respectfully disagree.

Applicants respectfully submit that the above reasoning misses a key distinction between claims 1, 9 and 16, and Rostoker. It is respectfully submitted that Rostoker does not disclose solder mask 112, let alone trench 124 formed within solder mask 112. A comparison of Rostoker (such as FIG. 6) and FIG. 1 of the present application clearly indicates that Rostoker does not disclose, teach or suggest solder mask 112, let alone solder mask trench 124 formed within solder mask 112. Applicants respectfully submit that there is no teaching or suggestion in either Rostoker or Dory to modify Rostoker and include a solder mask in Rostoker and a trench therein.

Applicants respectfully submit that it is not sufficient for the Examiner to state that a modification can be made to Rostoker, but a motivation or desire must be shown on the part of one of ordinary skill in the art for making such modification. For example, why would one of ordinary skill in the art desire to modify Rostoker to include a solder mask and a trench therein? The Examiner has not offered any such motivation or desire, and applicants respectfully submit that such desire or motivation is totally lacking and would make Rostoker's design nonsensical. The Examiner should note the following guidance from the Federal Circuit:

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"The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification" (emphasis added). In re Gordon, 733 F.2d 900, 902 (Fed. Cir. 1984) (see also In re Fitch, 972 F.2d 1260 (Fed. Cir. 1992))

Similarly, as stated by the Federal Circuit in In re Chu, 66 F.3d 292, 298 (Fed.

Cir. 1995):

In a proper obviousness determination, "whether the changes from the prior art are 'minor', ... the changes must be evaluated in terms of the whole invention, including whether the prior art provides any teaching or suggestion to one of ordinary skill in the art to make the changes that would produce the patentee's ... device." (citations omitted.) This includes what could be characterized as simple changes, as in In re Gordon, 733 F.2d 900, 902, 221 U.S.P.Q. (BNA) 1125, 1127 (Fed. Cir. 1984) (Although a prior art device could have been turned upside down, that did not make the modification obvious unless the prior art fairly suggested the desirability of turning the device upside down). (emphasis added.)

It is respectfully submitted that the cited references of record do not suggest the desirability of modifying Rostoker to include a solder mask in Rostoker and a trench therein.

For the foregoing reasons, Applicants respectfully submit that the present invention as defined by independent claims 1, 9, and 16 is not taught, disclosed, or suggested by the art of record. Thus, independent claims 1, 9, and 16 are patentably distinguishable over the art of record. As such, the claims depending from independent claims 1, 9, and 16 are, *a fortiori*, also patentable for at least the reasons presented above and also for additional limitations contained in each dependent claim.

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B. Rejections of Claims 5, 14, and 18 under 35 USC §103(a)

The Examiner has rejected claims 5, 14, and 18 under 35 USC §103(a) as being obvious over Rostoker in view of Dory, and further in view of U.S. Patent Number 5,969,461 to Anderson, et al. ("Anderson"). Applicant respectfully submits that claims 5, 14, and 18 depend from independent claims 1, 9, and 16, respectively, and thus, claims 5, 14, and 18 should be allowed at least for the same reasons discussed above in conjunction with patentability of independent claims 1, 9, and 16.

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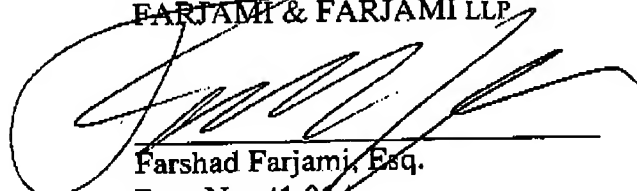
C. Conclusion

Based on the foregoing reasons, the present invention, as defined by independent claims 1, 9, and 16, and the claims depending therefrom, is patentably distinguishable over the art cited by the Examiner. Thus, outstanding claims 1-20 are patentably distinguishable over the art cited by the Examiner. As such, and for all the foregoing reasons, an early Notice of Allowance directed to all claims 1-20 remaining in the present application are respectfully requested.

Date: 12/14/04

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I hereby certify that this correspondence is being filed by facsimile transmission to United States Patent and Trademark Office at facsimile number (703) 872-9306, on the date stated below.

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